REMARKS

In the outstanding Office Action, claim 1 was rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Publication No. US 2004/0106292 to Sato et al. ("Sato") in view of Applicants' admitted prior art ("AAPA"); claims 2-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sato in view of AAPA and further in view of U.S. Patent No. 6,596,607 to Ahn ("Ahn"); and rejected claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Sato, in view of AAPA, and further in view of U.S. Patent No. 6,191,002 to Koyanagi ("Koyanagi"). By this amendment, Applicants have amended claim 1. Claims 1-5 remain pending in this application.

I. Interview of June 30, 2005

Applicants kindly thank the Examiner for the courtesy extended to Applicants' representatives in the interview of June 30, 2005. In the interview, Applicants' representatives asked the Examiner to withdraw the finality of the rejection, because the Examiner failed to rebut or answer all of Applicants' arguments presented in Applicants' previous Response, filed January 3, 2005. Specifically, the Examiner failed to answer or rebut Applicants' arguments directed to the technical mistakes or misunderstandings of Sato, as presented at page 5 in the Response filed January 3, 2005. Moreover, the Examiner failed to answer or rebut Applicants' arguments directed to the lack of motivation for combining the references.

Regarding Applicants' arguments directed to the technical mistakes or misunderstandings of Sato, the Examiner acknowledged that the description of the coating film 6c in Sato is not clear, but did not agree that the Office Action of September 2, 2004 contained technical misunderstandings of Sato. The Examiner stated that

although Sato does not explicitly teach vaporizing the polysilazane coating film, it is well-known in the art to do so, as evidenced by the description in AAPA. The Examiner asserted that the combination of the teaching of Sato with AAPA implied that "the coating film 6c ... made of silicon oxide," as stated at lines 18-22 of paragraph [0055], is merely the vaporized "coating film 6c, such as ... polysilazane," as stated at lines 12-18 of the same paragraph. Accordingly, the Examiner stated that Sato did not contain technical inconsistencies. Applicants' representatives did not, and do not, agree with the Examiner's characterization of Sato in this regard.

Regarding Applicants' arguments directed to the lack of motivation for combining the references, the Examiner asserted that the claims in their current form did not specify an exact sequence of steps. The Examiner believed that the claims were merely a broad recitation of steps which could be performed in any order. The Examiner indicated that an amendment including language to clearly indicate that the step of "heating said silicon oxide left in said device isolation trench to remove impurities for densification" occurs after the step of "removing said film of the silicon oxide leaving a residue inside said device isolation trench," may distinguish over the applied references. The Examiner did acknowledge that he had failed to answer or rebut all of Applicants' arguments, and was persuaded to withdraw the finality of the previous rejection. The Examiner issued a new final rejection, mailed July 7, 2005, to which Applicants now respond.

II. Rejections under 35 U.S.C. § 103(a)

Regarding the rejection of claim 1 under 35 U.S.C. § 103(a), Applicants respectfully disagree with the Examiner's assertions and conclusions as set forth in the

Office Action[1]. Accordingly, Applicants respectfully traverse these rejections on the grounds that the Examiner has failed to establish a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness under 35 U.S.C. §103(a), each of three requirements must be met. First, the reference or references, taken alone or combined, must teach or suggest each and every element recited in the claims. *See* M.P.E.P. §2143.03 8th Ed. (Rev. 2), May, 2004. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references in a manner resulting in the claimed invention. Third, a reasonable expectation of success must exist. Moreover, each of the three requirements must "be found in the prior art, and not be based on applicant's disclosure." *See* M.P.E.P. § 2143 8th Ed. (Rev. 2), May, 2004. At a minimum, the Examiner cannot establish that the references teach each and every element of the claims and that there is motivation for combining the references in the manner the Examiner is suggesting.

A. Sato in view of AAPA

Claim 1, as amended, recites a combination including, "*after* removing said film, heating said residue to remove impurities for densification," as recited in claim 1 (emphasis added). Sato fails to teach or suggest at least this element.

At paragraph [0056], Sato teaches that "thermal processing at 800[°]C is performed on the semiconductor substrate 1." Then, Sato teaches that "*[n]ext* ...the insulating film 3 is used as an etching-stopper to polish the insulating film 6d ... [t]hen

1 The Office Action contains a number of statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicants decline to automatically subscribe to any statement of characterization in the Office Action.

etching processing is performed on the semiconductor substrate in order to etch and remove the insulating films 2 and 3." Sato, paragraph [0057] (emphasis added). Sato thus teaches that "etching ... films 2 and 3" is performed after "thermal processing at 800[°]C is performed on the semiconductor substrate 1." Accordingly, even if the above respective elements of Sato can be construed as respectively constituting Applicants' claimed "heating said residue to remove impurities for densification," and "removing said film," Sato fails to teach or suggest at least the element "*after* removing said film, heating said residue to remove impurities for densification," as recited in claim 1 (emphasis added).

AAPA fails to cure the deficiencies of Sato. AAPA, cited at page 3 of the Office Action for allegedly "teach[ing] that it is well known in the art to form a silicon oxide film by modifying the silazane perhydride polymer solution by vaporizing a solvent from said coat," includes a method comprising a sequence of steps including "modifying the coat into a silicon oxide through chemical reaction," then "performing densification," and finally "removing undesired portions to bury the silicon oxide in the trenches." Applicants' specification, page 1, lines 30-32. Accordingly, AAPA also teaches a method wherein "heating said residue for densification" would be performed **prior** to "removing said film, except for a residue of silicon oxide remaining inside said device isolation trench." The combination of references thus fail to teach or suggest at least "*after removing said film* of the silicon oxide, heating said residue to remove impurities for densification," as recited in claim 1 (emphasis added).

Moreover, since the proposed combination would teach or suggest "heating said residue to remove impurities for densification" prior to "removing said film, except for a

residue of silicon oxide remaining inside said device isolation trench," Applicants respectfully submit that the proposed combination of references would produce a semiconductor device with undesirable characteristics, and accordingly, there is no motivation for combining the references in the manner that the Examiner is suggesting. It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983). Performing the method using this order of steps, would cause shape deterioration in the device isolation trenches. *See* Applicants' specification at, for example, page 3, lines 3-25. Conversely, the method as claimed in Applicants' claim 1, performs the steps in a reverse order, allowing silicon oxide to be buried in the device isolation trench without any adverse shape deterioration. Accordingly, since shape deterioration, which would result from AAPA, is undesirable, there is no motivation for combining the references in the manner the Examiner is suggesting. Since there is no motivation to combine the references, and the references fail to teach or suggest each and every element of the claim, the Examiner has failed to establish a *prima facie* case of obviousness. Accordingly, Applicants respectfully request that the rejection of claim 1 under 35 U.S.C. § 103(a) be withdrawn.

B. Sato in view of AAPA and further in view of Ahn

Claims 2-4 depend from claim 1 and thus require all of the elements of claim 1. Since Sato in view of AAPA fails to teach or suggest each and every element of claim 1, as discussed above, that combination of references also fails to teach all of the elements required by claims 2-4. Ahn fails to cure the deficiencies of Sato and AAPA.

Ahn is cited by the Examiner for allegedly teaching:

> that is well known in the art to further include a silicon oxide film (109) over the surface of the etching resistive mask containing silicon nitride (103) (see fig. 6) after the formation of the device isolation trench (121) (see figs. 5-6), before forming the coat of [polysilazane] solution (119) (see fig. 6 and col. 4, lines 20-27 and 32-35), and after etching said silicon nitride (103) to etch back opening edges.

Office Action, page 4.

However, even assuming this statement is correct, Ahn fails to teach or suggest at least "after removing said film, heating said residue to remove impurities for densification," as recited in claim 1, and required by claims 2-4. Since the references, whether taken alone or in combination, fail to teach each and every element of the claims, the Examiner has failed to establish a *prima facie* case of obviousness. Accordingly, Applicants respectfully request that the rejection of claims 2-4 under 35 U.S.C. § 103(a) be withdrawn.

C. Sato in view of AAPA, and further in view of Koyanagi

Claim 5 depends from claim 1 and thus requires all of the elements of claim 1. Since Sato in view of AAPA fails to teach or suggest each and every element of claim 1, as discussed above, that combination of references also fails to teach all of the elements required by claim 5.

Koyanagi is cited by the Examiner for allegedly teaching "that it is well known in the art to remove silicon oxide by CMP." Office Action, page 5. Koyanagi fails to cure the deficiencies of Sato and AAPA, because Koyanagi also fails to teach or suggest at least the combination including "after removing said film, heating said residue to remove impurities for densification," as recited in claim 1.

Koyanagi, at Fig. 5 S3, teaches heating the substrate having an SiO_2 film to further densify the film. Koyanagi, col. 8, lines 54-59. Subsequently, the SiO_2 film is polished using CMP until only a residue is left in the trench. *Id.* at col. 8, lines 61-65. As explained in Fig. 15, and in Applicants' specification at, for example, page 3, lines 3-25, this order of processes will inevitably cause shape deterioration in device isolation trenches. Conversely, Applicants' claim 1 performs the processes in a reverse order to avoid any shape deterioration in device isolation trenches. Since the references fail to teach or suggest each and every element of the claim, the Examiner has failed to establish a *prima facie* case of obviousness. Accordingly, Applicants respectfully request that the rejection of claim 5 under 35 U.S.C. § 103(a) be withdrawn.

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: October 7, 2005

By: _____
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